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(54) Compressible, laminated fire-sealing material

(57) A compressible laminate for use in forming a fire seal in a cavity or void in building construction comprises a layer of compressible fire-resistant or fire-retardant material, e.g. open-cell foam, which permits the passage of air in the plane of the laminate and one or more layers of a preferably encapsulated intumescent sheet material comprising graphite and vermiculite. The laminate may be used, *inter alia*, in elongate block form.

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SPECIFICATION

Compressible, laminated fire-sealing material

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This invention relates to compressible, laminated fire-sealing material.

In building construction it is often necessary to provide a first seal across a joint or void which is of irregular and/or varying shape, for example:

- 1) Across or over the top of a cavity in a wall structure, particularly in timber frame construction.
- 2) Across a thermal expansion/contraction joint between vertical walls in a building.
- 3) Across a flexural movement joint to accommodate vertical movement of a floor or roof under load (e.g. from wind or snow) or horizontal movement of a floor slab relative to a wall or steel column.
- 4) Across irregular joint details.
- 5) Across a joint in an acoustically insulated building.
- 6) Around a penetration for ducting or cables.
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For forming a fire-resistant seal across such structural joints and gaps there is currently available an elongate block of fire-resistant foam having a thickness of 10 or 20 mm and faced on opposed major faces with flexible intumescent sheet material, the seal being formed by inserting one or more blocks into the void under compression. These blocks suffer from two disadvantages: firstly, the foam is a closed cell silicone rubber foam which does not permit the passage of air through it, thus preventing ventilation; and, secondly, the intumescent material is subject to chemical attack, particularly by atmospheric carbon dioxide and water in liquid form or even, in areas of high humidity, in vapour form, necessitating the application of protective coating to the intumescent material.

According to the present invention there is provided a compressible laminate for use in forming a fire seal in a cavity or void, the laminate comprising a layer of compressible fire-resistant or fire-retardant material which permits the passage of air in the plane of the laminate and one or more layers of an intumescent sheet material comprising graphite and vermiculite.

The compressible material may take the form of bellows, for example a neoprene extrusion, but is preferably an open cell foam, for example a polyether foam manufactured by Featherbed Ltd. which slowly ashes when subjected to fire; examples of other foams that may be used are silicon rubber foam, expanded neoprene, PVC foam and polyethylene foam. If the foam is rather rigid additional compressibility can be gained by forming the

layer with a hollow core.

The intumescent material is preferably that known as Intumex L 1.8 or 2.5 which develops a pressure 7 or 14 atmospheres, respectively. Not only is such a material resistant to attack by water and atmospheric carbon dioxide, but its capability of generating a higher pressure than conventional hydrated sodium silicate enables comparatively less material to be used. As graphite-vermiculite based intumescent material is mechanically weaker than hydrated sodium silicate it is advantageous to encapsulate the material in a thermoplastic, e.g. PVC, extrusion or in foil or to laminate it to thermoplastics, e.g. PVC, sheet.

A preferred construction of the laminate according to the present invention is that in which the foam layer is sandwiched between two layers of intumescent sheet material; however the reverse construction in which the intumescent material is sandwiched between two layers of foam may also be employed.

The laminate according to the present invention may be used to form part of a composite laminate having as a core, a rigid, fire-resistant board exhibiting good tensile and flexural strength. A suitable base material for the board is calcium silicate or rock wool. It will be appreciated that the composite laminate is compressible in the thickness direction but rigid in directions perpendicular thereto.

The laminate is normally used in the form of elongate blocks which are inserted into the void in layers until the void is filled. For certain applications, for example in a wet environment where moisture absorption could be a disadvantage, it is desirable to encapsulate the blocks in for example a metal, nylon or polyester foil. When the surface of the void or cavity is constructed by rough brickwork or concrete, installation is facilitated by providing a layer of aluminium foil on the faces of the blocks likely to come into contact with the rough surface. Any metallic covering has the advantageous effect of conducting heat and promoting rapid intumescence of the intumescent material across the full width of the fire seal. Where movement of air through the laminate is not required, the main face of the installed seal may be covered with, for example, aluminium foil or fire-resistant paper. Such a covering may be reinforced by wire mesh, expanded mesh, calcium silicate board or the like.

In the event of fire cold smoke condenses out in the foam and, as the temperature rises to the range of 120–140°C, the intumescent material starts to react, compressing the foam core and sealing off the cavity or void.

An embodiment of the invention will now be described by way of example.

A strip of fire-resistant polyether foam manufactured by Featherbed Ltd. under the trade name Fireseal and having a width of 38mm and thickness of 35mm have bonded to each

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major surface thereof a hollow PVC extrusion combining a strip of Intumex L (2.5mm) graphite-vermiculite intumescent material (manufactured by Chemie Linz AG, Austria). The adhesive used for bonding is a standard contact adhesive. The strip is then cut into 1 metre lengths to form blocks suitable for insertion into a cavity or void to form a fire seal thereacross.

10 CLAIMS

1. A compressible laminate for use in forming a fire seal in a cavity or void, the laminate comprising a layer of compressible fire-resistant or fire-retardant material which permits the passage of air in the plane of the laminate and one or more layers of an intumescent sheet material comprising graphite and vermiculate.
2. A laminate as claimed in claim 1, in which said compressible material is an open-cell foam.
3. A laminate as claimed in claim 2, in which the compressible layer of open-cell foam has a hollow core.
4. A laminate as claimed in claim 1, 2 or 3, in which said intumescent sheet material is one capable of developing a higher pressure sodium silicate intumescent material.
5. A laminate as claimed in claim 4, in which the graphite-vermiculite based intumescent material is encapsulated in a thermoplastics extrusion or in foil, or is laminated to a thermoplastics sheet.
6. A laminate as claimed in any preceding claim, in which the foam layer is sandwiched between two layers of intumescent sheet material.
7. A laminate as claimed in any one of claims 1 to 5, in which said intumescent sheet material is sandwiched between two layers of said compressible foam.
8. A laminate as claimed in claim 1 and substantially as herein described.
9. A compressible laminate substantially as described in the foregoing embodiment of the invention described by way of example.
10. A laminate as claimed in any preceding claim and in elongate block form.
11. A block form laminate as claimed in claim 10 and at least partly faced with foil.
12. A composite laminate comprising a rigid fire-resistant board and a laminate as claimed in any preceding claim laminated thereto.
13. A laminate as claimed in claim 12, in which the material of said board is based on calcium silicate or rockwool.
14. The features herein disclosed, or their equivalents, in any patentably novel selection.